Chapter 20
Revolutionizing the Farm-to-Table Journey:
A Comprehensive Review of Blockchain Technology in Agriculture Supply Chain

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ABSTRACT

In recent years, blockchain technology has gained a lot of attention for its various applications in various fields, with agriculture being one of the most promising. The use of blockchain in agriculture covers areas such as food security, information systems, agribusiness, finance, crop certification, and insurance. In developing countries, many farmers are struggling to earn a living, while in developed countries, the agriculture industry is thriving. This disparity is largely due to poor supply chain management, which can be improved using blockchain technology. Blockchain provides a permanent, sharable, and auditable record of products, improving product traceability, authenticity, and legality in a cost-effective manner. This chapter aims to compile all existing research on blockchain technology in agriculture and analyze the methodologies and contributions of different blockchain technologies to the agricultural sector. It also highlights the latest trends in blockchain research in agriculture and provides guidelines for future research.

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INTRODUCTION

The global agriculture sector holds immense significance in supporting the economies of nations and feeding the world's population. However, farmers face a plethora of challenges that negatively impact their livelihoods, including climate change, price volatility, and lack of access to adequate storage facilities and market information. Despite government interventions to aid farmers, these efforts often fall short in effectively addressing these issues, due to inefficiency and intermediation that frequently results in exploitation. To mitigate these challenges, a blockchain-based system for agriculture could provide a paradigm shift in the industry. Supply chain management and blockchain technology would work in tandem to ensure the integrity of data related to the quantity, cost, and quality of produce, making it nearly impossible for intermediaries to manipulate or alter information. This system would enable farmers to track their crops and stored goods, as well as access real time market data, allowing them to make informed decisions and receive fair prices for their produce. The implementation of blockchain in agriculture would also eliminate the need for intermediaries, creating a more direct link between farmers and consumers and increasing transparency and security in the sector. In addition, this system would facilitate the modernization of the agriculture industry, enabling farmers to participate more effectively in the global market.

The comprehensive literature review is essential for us to address the following research questions: (1) What are the prevalent blockchain applications in agriculture-related projects? (2) What are the significant obstacles faced by these blockchain applications during deployment and how can they be overcome? (3) How can blockchain technology be enhanced to establish a trustworthy and efficient food supply chain in the future? (4) What are the primary advantages of implementing supply chain in agriculture?

Current efforts to improve and modernize agriculture are seeking new methods and advancements to create a more open and trustworthy environment in the industry. One of the innovative solutions being explored is the use of blockchain technology. Unlike traditional centralized agricultural systems, blockchain utilizes a decentralized system for storing and accessing data that can be shared among multiple parties who may not necessarily trust each other. Blockchain is a digital database that is managed and updated using cryptography. Each member of the blockchain system has a copy of all previous transactions processed through the system. This enables the establishment of a structured and reliable system to ensure food safety and financial benefits for all participants engaged in the food distribution network. However, the system is decentralized, meaning that no single party or node controls it, making it a secure and transparent system. In order for transactions to occur, a consensus must be reached among a majority of nodes, making it a verifiable and trustworthy system for all participants. In other words, for a transaction to occur, a set of rules and procedures, known as a compliance algorithm, must be followed to ensure the agreement and validation of all parties involved. This process is irreversible and eliminates the need for intermediaries, making the system autonomous. Trust between participants is established through a foolproof system of rules and codes.

LITERATURE REVIEW

In Revathy and Sathya Priya (2020), blockchain based producer consumer model (BPCM) aims to bridge the gap between farmers and consumers by enabling direct transactions through a blockchain-based platform. The purpose is to eliminate intermediaries, provide transparency and control over prices for